PROJECT NUMBER: 1706
PROJECT TITLE: Thermal and Combustion Processes
PROJECT LEADER: D. B. Losee
PERIOD COVERED: July, 1987

I. PROJECT ART (B. Waymack)

A. Objective: Determine the extent to which nicotine can be reduced by low temperature processing of tobacco.

B. Results: J7MH filler has been treated at 70°C, 76°C, and 85°C for five hours in flowing helium. Preliminary results at 85°C have shown that the nicotine (determined as pyrolysis nicotine) can be reduced by approximately 20%, while a sample treated at 70°C is reduced by 10%.

C. Plans: Investigate effects of water and NH_4HCO_3 pretreatment on nicotine reduction. Establish other major components lost during this thermal processing.

II. LOW DENSITY ROD PROGRAM (B. Waymack, D. Driscoll)

A. Objective: Characterize pectin binder degradation to establish if alternative treatments can lead to possible end product improvement.

B. Results: Examination of degraded citrus pectin (provided by Sue Wrenn) and a control has shown, using EGA/MS, that the thermal degradation does not significantly alter the acid and ester functionalities. There are preliminary indications from DTG and EGA/MS that a high temperature (~750°C) ignition occurs in the control. This 750°C ignition is no longer present after degradation. The possible role that calcium plays in this phenomena is being explored.

C. Plans: Continue pectin characterization with the aim toward providing alternative treatments of pectin to achieve the desired binding properties.

III. LOW DENSITY ROD PROGRAM (D. Driscoll)

A. Objective: Establish utility of TGA as a quality assurance tool for pectin binders.

B. Results: TGA comparisons of percent weight loss for specific temperature regions demonstrate excellent reproducibility within each batch of undegraded citrus pectin. The only statistically different weight loss region is between 30°C and 170°C for two batches of undegraded citrus pectin. These differences are due to either different drying or packaging conditions.

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Differences in the 130 - 350°C region appear sensitive to the extent to which pectin has been degraded. In addition, as noted above, it appears that degraded pectin ignites at a lower temperature than the control.

C. **Plans**: Continue batch sampling of both undegraded and degraded samples of pectin using TGA.

IV. OPERATIONS SUPPORT (P. Henderson)

A. **Objective**: Establish operating specifications for tipping adhesives.

B. **Results**: The flow characteristics of several tipping adhesives which are currently used in the Manufacturing Center have been evaluated at high shear rates. With the exception of one adhesive, all tipping adhesives examined thus far reach a critical shear rate above which they aglomerate. These critical shear rates appear to be characteristic for the various adhesives. Substantial variations in these critical shear rates are seen among adhesives which have the same nominal Brookfield viscosities.

Below these critical shear conditions, all of the adhesives undergo shear thinning. In this region a linear regression of shear stress versus shear rate data appears to provide a meaningful measure of operating viscosity. Each one of these best fit viscosities is substantially less than the corresponding Brookfield value.

C. **Plans**: Explore the effects that small changes in temperature may have on these critical shear conditions.

VI. OPERATIONS SUPPORT (D. Driscoll)

A. **Objective**: Support Quality Assurance and Operations Services in implementing thermogravimetric analysis as a screening test for incoming adhesives.

B. **Results**: Diagnosed hardware and software problems on two newly acquired Perkin Elmer TGA-7 instruments. Trained personnel on the use of the TGA-7 after above problems were solved.

C. **Plans**: Trouble shoot software, documenting programing errors, while writing the method to be implemented in QA for screening adhesives.

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